

Water Management Plan

United States Environmental Protection Agency
Office of Research and Development
National Exposure Research Laboratory
Environmental Sciences Division
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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EXPOSURE RESEARCH LABORATORY
ENVIRONMENTAL SCIENCES DIVISION**

WATER MANAGEMENT PLAN

Approved by:



Fred L. Childers, Facility Manager

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Date

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1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE

In order to meet the needs of existing and future populations and ensure that habitats and ecosystems are protected, the nation's water must be sustainable and renewable. Sound water resource management, which emphasizes careful, efficient use of water, is essential to achieve these objectives.

Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources. As we face increasing risks to ecosystems and their biological integrity, the inextricable link between water quality and water quantity becomes more important. Water efficiency is one way of addressing water quality and quantity goals. The efficient use of water can also prevent pollution by reducing wastewater flows, recycling process water, reclaiming wastewater, and using less energy.

EPA recognizes that regional, state, and local differences exist regarding water quality, quantity, and use. Differences in climate, geography, and local requirements influence the water efficiency programs applicable to specific facilities. Therefore, EPA is establishing facility specific Water Management Plans to promote the efficient use of water and meet the water conservation requirements under Executive Order 13123, Greening the Government Through Efficient Energy Management.

This Water Management Plan has been established to document and promote the efficient use of water at the U.S. EPA National Exposure Research Laboratory (NERL), Environmental Sciences Division (ESD) Laboratory facility located in Las Vegas, Nevada. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines under Executive Order 13123.

2.0 FACILITY DESCRIPTION

The ESD Laboratory occupies five adjacent buildings on the campus of University of Nevada at Las Vegas (UNLV). ESD employees are actively engaged in research on environmental applications of remote sensing; landscape ecology and comparative ecological risk assessment; understanding and quantifying the different pathways through which people are exposed to contaminants; developing novel techniques to characterize hazardous waste sites to increase the cost-effectiveness of remediation; and developing advanced environmental analytical chemistry techniques in support of a broad range of EPA's monitoring and measurement needs.

The laboratory buildings are owned by UNLV, and assigned to EPA through a lease held by U.S. General Services Administration. The current 15 year lease expires in 2015. EPA is responsible for paying for water and other utility costs associated with the facility.

Five buildings, constructed in 1964 and totaling 92,700 square feet of conditioned space, comprise the complex:

- Chemistry Laboratory (25,452 square feet)
- Quality Analysis Laboratory (14,409 square feet)
- Environmental Annex (2,184 square feet)
- Executive Center (28,740 square feet)
- Monitoring Systems Laboratory (21,915 square feet)

Laboratory operations are performed in the chemistry laboratory, the quality analysis laboratory, and one of the bays in the environmental annex. The remainder of the environmental annex is used for equipment storage. The executive center is predominantly made up of office space. The monitoring systems laboratory is mostly vacant, except for one section occupied by the facility O&M contractor.

3.0 FACILITY WATER MANAGEMENT GOALS

The ESD Laboratory conducts its operations consistent with the EPA Environmental Policy Statement, provided below. In keeping with this policy, the laboratory will strive to continuously improve its performance with respect to water conservation.

Environmental Policy Statement

EPA's mission is to protect human health and safeguard the natural environment by setting standards for environmental protection, assisting others in reducing or preventing pollution, conducting environmental research and enforcing environmental protection standards in conjunction with other government agencies. In support of that mission, proper management of the environmental impacts of our operations and facilities is essential.

EPA continues to encourage regulated entities to use effective EMSs that focus on compliance, pollution prevention, and public outreach. With this policy, EPA is committing to implement EMSs with these attributes for our own employees, operations and facilities. EPA will endeavor to become a leader in executing a model environmental management system within the Agency.

At EPA, we commit to reduce the environmental impacts and consumption of natural resources from our facility operations and comply with all legal and applicable requirements. Our EMS will be designed to meet the following goals:

- Ensure compliance by meeting or exceeding all applicable environmental requirements;
- Strive to continuously improve environmental performance in terms of both regulated and unregulated environmental impacts (e.g., energy and water conservation);

- Employ source reduction and other pollution prevention approaches whenever practicable;
- Require consideration of environmental factors when making planning, purchasing, and operating decisions;
- Establish, track, and review specific environmental performance goals; and
- Share information on environmental performance with the public and allow appropriate opportunities for input into EMS development and implementation.

4.0 UTILITY INFORMATION

Contact Information

Potable water and sewer service is provided through UNLV:

Phil Plentzas
 Director of Facility Services and Energy Management
 University of Nevada at Las Vegas
 4505 S. Maryland Parkway
 Box 451048
 Las Vegas, NV 89154-1048
 (702) 895-4089

The ESD Laboratory is billed for potable water use, based on metered supply to the building provided by the Las Vegas Valley Water District. A portion of this metered supply is used for exterior landscape irrigation. Since UNLV and not the ESD Laboratory is responsible for maintaining the exterior landscape, the portion of water used for irrigation is metered separately and the cost of this water is deducted from the ESD Laboratory water bill. The cost of sewer service is not billed directly.

Rate Schedule

The water billing rate is a tiered system:

Monthly Amount	Rate per 1000 Gallons
0 - 120,000 gallons	\$1.126
120,001 - 240,000 gallons	\$1.844
241,001 - 1,680,000 gallons	\$2.490
More than 1,680,000 gallons	\$3.146

The tier thresholds presented above are based on combined flow from three separate 2-inch water meters. They include both Las Vegas Valley Water District base charges, and Southern Nevada Water Authority surcharges.

Payment Office

Gerald Billings
U.S. EPA, Financial Management Division
Mail Code 2734-R
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

(202) 564-4841

5.0 FACILITY INFORMATION

The ESD Laboratory complex is made up of five separate buildings, listed in Section 2. Laboratory activities are primarily conducted in the Chemistry Laboratory (CHL) and the Quality Assessment Laboratory (QAL). Each of these two laboratories are equipped with separate, central reverse osmosis/deionized water supply systems to provide pure water for laboratory use, and separate laboratory wastewater neutralization pits for treatment prior to discharge to the sanitary sewer. Each building is heated separately with gas-fired, recirculated hot water. Building cooling for all buildings but the environmental annex is provided by a central chiller plant located in the Quality Assessment Laboratory building. Cooling for the occupied portion of the environmental annex is provided by a water-cooled air conditioning unit and an associated small, stand-alone cooling tower. Two of the storage rooms in the environmental annex are equipped with manually controlled evaporative coolers; these rooms are not occupied and the coolers are typically not used.

Water is used for sanitary needs, laboratory processes, and mechanical systems. Additional details on facility water use are provided in the following sections.

Major Water Using Processes

Estimates of water consumption by major use area are provided in Table 1. These data reflect facility water use between January and December 2003.

Table 1

Major Water Using Processes - ESD Laboratory, Las Vegas

Process	FY 2003 Annual Consumption (gallons)	Percent of Total	Comments
Single-pass equipment cooling water	500,000	9.4	Engineering estimate
CHL process water use	475,000	8.9	Calculated as metered flow minus single-pass cooling component
QAL process water use	51,000	1.0	Metered
Cooling tower make-up water	3,800,000	71.3	Engineering estimate based on seasonal use
Sanitary and other miscellaneous uses	500,000	9.4	Calculated as remaining difference from metered total
TOTAL	5,326,000	100	Metered

Additional detail on assumptions and calculations supporting these water use estimates are provided in Appendix A.

Measurement Devices

Incoming city water supply is metered. A portion of the incoming supply is used for landscape irrigation, which is managed and controlled by UNLV. The flow for landscape irrigation is submetered and this portion of the total flow is deducted from the laboratory's water bill. Data from the city water and irrigation water meters are recorded monthly. Meters are also installed on the two wastewater discharge systems that collect laboratory process wastewater from the QAL and CHL buildings. Data from the wastewater discharge flow meters are recorded daily.

Shut-off Valves

Each separate building is equipped with a water shut-off valve, located as follows:

- Chemistry Laboratory - Mechanical room
- Quality Analysis Laboratory - Mechanical room
- Environmental Annex - Mechanical room
- Executive Center - Valve pit on the south building exterior
- Monitoring Systems Laboratory - Mechanical room

Occupancy and Operating Schedules

Approximately 150 employees work at the ESD Laboratory. The laboratory operates on a flex time schedule and is typically occupied between 6:00 a.m. and 6:00 p.m., Monday through Friday.

6.0 BEST MANAGEMENT PRACTICE SUMMARY AND STATUS

The Federal Energy Management Program (FEMP) has identified water efficiency improvement Best Management Practices (BMPs) in ten possible areas. Implementation of BMPs in four or more areas are required under FEMP guidance. The ESD Laboratory has adopted and will maintain BMPs in six of the ten areas:

- ✓ Public Information and Education Programs
- ✓ Distribution System Audits, Leak Detection and Repair
- ☐ Water Efficient Landscape
- ✓ Toilets and Urinals
- ✓ Faucets and Showerheads
- ☐ Boiler/Steam Systems
- ✓ Single-Pass Cooling Systems
- ✓ Cooling Tower Systems
- ☐ Miscellaneous High Water-Using Processes
- ☐ Water Reuse and Recycling

Public Information and Education Programs (BMP #1)

The Las Vegas Laboratory promotes water conservation and awareness using the EPA laboratory “Every Drop Counts” water conservation poster series. Conservation posters are displayed in prominent locations within the laboratory buildings. In addition, employees will be educated on water and other resource conservation topics through the implementation of laboratory EMS, which is in the initial stages of development. The laboratory also sponsors an annual earth day event for the local community that features “EP,” a cartoon mascot desert tortoise. EP teaches school children about the local desert ecology, and includes a discussion of water conservation practices each individual can adopt to save water.

Distribution System Audits, Leak Detection and Repair (BMP #2)

A screening level system audit was conducted in March 2004 and known water uses account for greater than 90 percent of water consumption.

Facility staff are trained to report leaks and malfunctioning water using equipment to the facilities management group. Reported problems are assigned a work order, which is completed by the facility operation and maintenance (O&M) contractor. The O&M contractor generally responds to each

request within one hour. They respond immediately to any emergency situations. In addition, the O&M contractor staff perform a daily visual inspection of all building public spaces, mechanical rooms, and central plant. Any problems identified are reported to the facility management group and corrected immediately.

Building janitorial care is provided by UNLV staff. They are also trained to report any leaking faucets or flush valves to the laboratory facilities management group.

Water Efficient Landscape

Landscape irrigation is provided by UNLV and is not managed or controlled by the ESD Laboratory. Therefore, this BMP area is not applicable to the laboratory operations.

Toilets and Urinals (BMP #3)

Older-style sanitary fixtures were replaced with water-efficient sanitary fixtures (1.6 gallons per flush (gpf) toilets and 1.0 gpf urinals) throughout all laboratory buildings in 2002. A total of 25 water efficient toilets and 19 water efficient urinals were installed.

Janitorial staff and employees are trained to report leaks or other maintenance problems, which are immediately corrected by the O&M contractor.

Faucets and Showerheads (BMP #4)

Ultra-efficient, 0.5 gallons per minute (gpm), lavatory faucets with automatic sensors to control flow were installed throughout all laboratory buildings in 2002 to conserve water. A total of 35 lavatory sinks were retrofitted with the new faucets. There are no employee washroom showers located within the laboratory complex. System pressure is maintained between 20 to 80 pounds per square inch.

Janitorial staff and employees are trained to report leaks or other maintenance problems, which are immediately corrected by the O&M contractor.

Boiler/Steam Systems

Boilers produce recirculating hot water, rather than steam. No steam condensate is generated; therefore, no BMP credit is claimed in this area.

Single Pass Cooling Systems (BMP #5)

The ESD Laboratory has made a concentrated effort to eliminate the use of potable water for single pass cooling by supplying laboratory equipment that requires cooling with point-of-use recirculating water chillers. Single pass cooling is still applied to cool the temperature control unit on the gas chromatograph located in Room CHL 54. A cost-effectiveness analysis to convert this unit from single-

pass cooling was conducted in June 2004 and given the heat load that needs to be dissipated the conversion was found to be not cost effective. However, water flow has been reduced and will be maintained at the minimum level necessary for sufficient heat transfer. Single pass cooling is also used to cool the ice maker located in the executive building lunch room. Cooling water flow to this machine had been continuous; however, the machine has been retrofitted with a solenoid valve which opens to provide cooling water flow only when the compressor is running.

BMP credit is claimed in this area as single pass cooling has been eliminated in all applications where it is cost effective to do so.

Cooling Tower Systems (BMP #6)

The laboratory is equipped with two cooling towers: a main tower that provides condenser water for the two chillers in the central plant, and a small unit that provides condenser water for chiller serving the environmental annex building. The cooling towers are monitored and maintained regularly by an HVAC technician on the staff of the O&M contractor. The cooling tower systems also undergo a monthly quality, performance, and water chemistry review by a cooling tower maintenance contractor. Chemical treatment is provided to control scale and corrosion. The main tower is also equipped with a side-stream sand filtration unit to reduce suspended solids in the recirculating water. Conductivity meters are used on each tower to automatically control tower blow down; the meters are regularly maintained by the cooling tower maintenance contractor. The blow down controllers are set to achieve 3 cycles of concentration, resulting in efficient water use, given the relatively high dissolved solids content of make up water (avg. of 1,000 $\mu\text{S}/\text{cm}$). Cooling tower water use is not directly metered. While BMP credit is claimed in this area, EPA's regional architect and engineer (A/E) is reviewing cooling tower and chiller operation and performance to determine if greater efficiency can be gained.

Miscellaneous High Water-Using Processes

Over time, the laboratory has converted many "wet" laboratory operations to dry, electronic methods. As the current laboratory processes do not use significant quantities of water, no specific BMP credit is claimed in this area.

Water Reuse and Recycling

Recycled cooling water use in the cooling tower is the primary water use at this facility, as discussed above under cooling tower systems. BMP credit for that system is claimed above.

7.0 DROUGHT CONTINGENCY PLAN

The Southern Nevada Water Authority, of which Las Vegas Valley Water District is one of seven member organizations, has established a four stage drought response scale. The differing levels of drought response are triggered by the expected Lake Mead water level:

No Drought - Lake Mead sustaining above 1,145 feet
Drought Watch - Lake Mead declining/expected below 1,145 feet
Drought Alert - Lake Mead below 1,145 feet
Drought Emergency - Lake Mead below 1,125 feet

Required drought response actions primarily focus on reducing the consumptive use of water (water not returned to a sanitary sewer). As a matter of general operating practice, the Las Vegas Laboratory already follows the water conservation approaches that could be required under drought conditions. Water is not used for exterior surface or equipment washing, misting, or ornamental fountains.

ESD staff will fully cooperate with UNLV if they determine that modification of the irrigation schedule or approach is required to respond to drought conditions.

Additional drought information from the Southern Nevada Water Authority is available at www.snwa.com

8.0 COMPREHENSIVE PLANNING

The Facility Manager will ensure the water supply, wastewater generation, and water efficiency BMPs are taken into account during the initial stages of planning and design for any facility renovations or new construction. These factors will also be considered prior to the purchase and installation of any equipment that would measurably change facility water consumption.

9.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

The ESD Laboratory is pursuing the following projects to improve measurement and achieve additional reductions in water use:

1) Cooling Tower Flow Meters. EPA will arrange for the installation and routine monitoring of flow meters on the make-up and discharge lines of the two cooling towers. Data from these meters, when trended over time, will provide a more accurate accounting of the flow balance around the cooling towers, and ultimately better cooling tower control. The cooling towers are estimated to account for over 70 percent of facility water consumption.

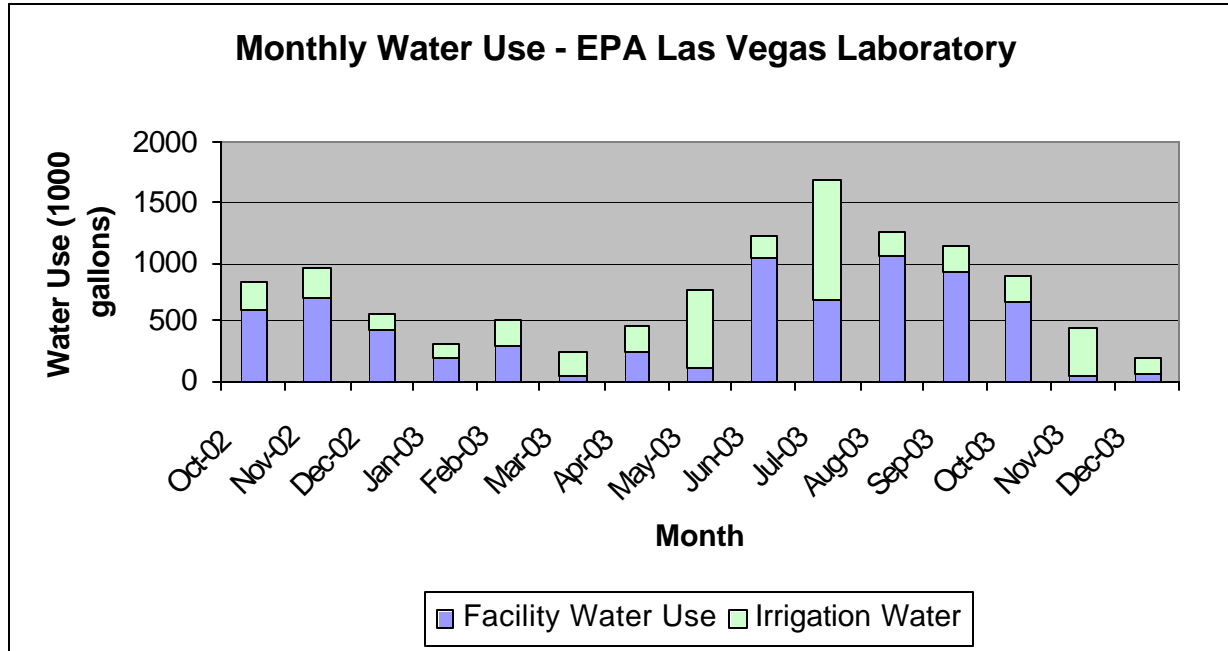
2) EMS Implementation. Water use will be considered as an environmental aspect in the EMS implementation project that is just starting. The EMS will provide a consistent method to ensure each working group within the laboratory considers water use and establishes water conservation goals related to their activities, as appropriate.

APPENDIX A
SUPPORTING WATER USE DATA

Water Balance
ESD Laboratory, Las Vegas, Nevada

Process	Annual Consumption (gallons)	Supporting Calculations
Single-pass equipment cooling water	500,000	Engineering estimate based on an observed approximate flow of 1 gallon per minute. $1 \text{ gal/min} * 60 \text{ min/hr} * 24 \text{ hr/day} * 365 \text{ days/year} = 525,600 \text{ gallons}$
CHL process water use	475,000	Based on metered total flow of 406,417 gallons between 10/1/03 and 2/27/04, prorated to full year, minus the single pass equipment cooling flow which is included in this metered total: $406,417 * 12/5 - 500,000 = 475,400$
QAL process water use	51,000	Based on metered total flow of 21,266 gallons between 10/1/03 and 2/27/04, prorated to full year. $21,266 * 12/5 = 51,038$
Cooling tower make-up water	3,800,000	Engineering estimate. Facility water use is highly seasonal. Assume December and January water use represents baseline use with minimal cooling load. Consumption above this baseline is attributed to cooling tower. Avg water use for Dec. and Jan. is 130,000 gal/month. $5,326,000 - (12 * 130,000) = 3,766,000$.
Sanitary and other miscellaneous uses	500,000	By difference: $5,326,000 - 3,800,000 - 475,000 - 51,000 - 500,000 = 500,000$. Estimate equates to 13.3 gallons per person per day, which is consistent with typical sanitary water use.
TOTAL	5,326,000	From monthly meter readings (excluding irrigation water). January to December 2003

Monthly Water Use Data



Note that irrigation water use is managed and controlled by UNLV and not the ESD Laboratory. Irrigation water use is not addressed by this plan.

Monthly Water Use 1000 gallons

Month	Total Water Use	Irrigation Deduction	Facility Water Use
Oct-02	839	233	606
Nov-02	960	253	707
Dec-02	563	129	434
Jan-03	320	121	199
Feb-03	500	209	291
Mar-03	250	209	41
Apr-03	468	209	259
May-03	755	636	119
Jun-03	1230	209	1021
Jul-03	1696	1011	685
Aug-03	1252	209	1043
Sep-03	1121	209	912
Oct-03	871	209	662
Nov-03	454	420	34
Dec-03	190	130	60